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cis-Dichloridobis(trimethoxyphosphine)palladium(II) at 125 K

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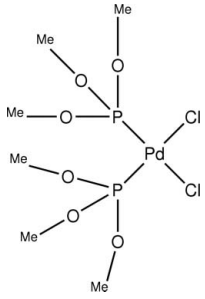
Key indicators: single-crystal X-ray study; T = 125 K; mean σ(O–C) = 0.010 Å; R factor = 0.054; wR factor = 0.090; data-to-parameter ratio = 16.4.

The title compound, $[PdCl_2(C_3H_9O_3P)_2]$, which is isotypic with its platinum analogue, adopts a slightly distorted *cis* square-planar geometry for the Pd centre.

Related literature

For the platinum analogue, see: Bao *et al.* (1987). For related platinum complexes, see: Slawin *et al.* (2007*a*,*b*). For *cis*-bis-(triisopropoxyphosphino)platinum dichloride, see: Slawin *et al.* (2009).



Experimental

Crystal data

$[PdCl_2(C_3H_9O_3P)_2]$
M_r = 425.46
Monoclinic, Cc
a = 6.8059 (19) Å
b = 16.897 (5) Å
c = 13.374 (4) Å
β = 100.086 (7)°
V = 1514.2 (7) Å^3
Z = 4
Mo $K\alpha$ radiation
μ = 1.80 mm^{-1}
T = 125 K
0.22 × 0.16 × 0.13 mm

Data collection

Rigaku SCXmini diffractometer
Absorption correction: multi-scan (*ABSCOR*; Higashi, 1995)
T_{min} = 0.662, T_{max} = 0.791
6333 measured reflections
2639 independent reflections
2338 reflections with $I > 2\sigma(I)$
R_{int} = 0.072

Refinement

$R[F^2 > 2\sigma(F^2)]$ = 0.054
$wR(F^2)$ = 0.090
S = 1.07
2639 reflections
161 parameters
H-atom parameters constrained
$\Delta\rho_{max}$ = 1.26 e Å^{-3}
$\Delta\rho_{min}$ = −0.71 e Å^{-3}
Absolute structure: Flack (1983), 1308 Friedel pairs
Flack parameter: −0.01 (5)

Table 1
Selected geometric parameters (Å, °).

Pd1—Cl1	2.356 (2)	Pd1—P1	2.241 (2)
Pd1—Cl2	2.358 (2)	Pd1—P2	2.233 (2)
Cl1—Pd1—Cl2	89.71 (8)	Cl2—Pd1—P1	90.32 (8)
Cl1—Pd1—P1	179.04 (9)	Cl2—Pd1—P2	177.30 (8)
Cl1—Pd1—P2	87.59 (8)	P1—Pd1—P2	92.38 (8)

Data collection: *SCXmini* (Rigaku, 2006); cell refinement: *PROCESS-AUTO* (Rigaku, 1998); data reduction: *PROCESS-AUTO*; program(s) used to solve structure: *SHELXS97* (Sheldrick, 2008); program(s) used to refine structure: *SHELXL97* (Sheldrick, 2008); molecular graphics: *CrystalStructure* (Rigaku, 2006); software used to prepare material for publication: *CrystalStructure*.

Supplementary data and figures for this paper are available from the IUCr electronic archives (Reference: FI2085).

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supplementary materials

Acta Cryst. (2009). E**65**, m1391 [**doi:10.1107/S1600536809041919**]

cis-Dichloridobis(trimethoxyphosphine)palladium(II) at 125 K

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Comment

$[PdCl_2(P(OMe)_3)_2]$ is isomorphous with its platinum analogue $[PtCl_2(P(OMe)_3)_2]$ (**2**) (Bao *et al.*, 1987) and adopts a *cis* square planar geometry, Whereas the Pt complex was reported to have quite dissmilar bond lengths for Pt—P1/Pt—P2 and Pt—Cl1/PtCl2 bond lengths these pairs of bonds are equivalent in the title compound.

The Pd—Cl bond bonds in (**1**) (Pd(1)—Cl(1) 2.356?(2), Pd(1)—Cl(2) 2.358?(2) Å) are shorter than the Pt—Cl bonds in (**2**) whilst the Pd—P bonds (Pd(1)—P(1) 2.241?(2), Pd(1)—P(2) 2.233?(2) Å) are longer than the Pt—P bonds in (**2**). The P—M—P angle (P(1)—Pd(1)—P(2) 92.38?(8) °) is reduced and the Cl—M—Cl angle is enlarged (Cl(1)—Pd(1)—Cl(2) 89.71?(8) °) on going from Pt to Pd with the palladium compound reported here having angles which are closer to ideal square planar .

Experimental

0.5 g (1.75 mmol) of $PdCl_2(COD)$ was dissolved in dichloromethane (5 mL) in a round-bottomed flask. To this 0.41 mL (3.5 mmol) of trimethylphosphite was added. The solution was stirred for 0.5 h at room temperature. The product was precipitated *via* slow diffusion of hexane and was then filtered off and dried under vacuum, $[PdCl_2(P(OMe)_3)_2]$ (1.36 mmol, *ca* 77%). ^{31}P-{^{1}H}NMR: δ 97.9 p.p.m..

Refinement

All H atoms were included in calculated positions and refined as riding atoms with Uĩso~(H) = 1.5 U~eq~. The highest peak in the difference map is 1.097 Å from atom Pd1.

Figures

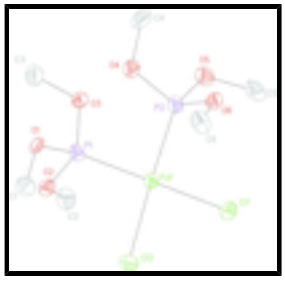

Fig. 1. The structure of the title compound with displacement ellipsoids drawn at the 50% probability level, hydrogen atoms omitted for clarity.

cis-Dichloridobis(trimethoxyphosphine)palladium(II)

Crystal data

$[PdCl_2(C_3H_9O_3P)_2]$	F_{000} = 848.00
M_r = 425.46	D_x = 1.866 Mg m^{-3}
Monoclinic, *Cc*	Mo *K*α radiation, λ = 0.71075 Å
Hall symbol: C -2yc	Cell parameters from 7139 reflections
a = 6.8059 (19) Å	θ = 3.1–27.7º
b = 16.897 (5) Å	μ = 1.80 mm^{-1}
c = 13.374 (4) Å	*T* = 125 K
β = 100.086 (7)º	Chunk, yellow
V = 1514.2 (7) Å^3	0.22 × 0.16 × 0.13 mm
Z = 4	

Data collection

Rigaku SCXmini diffractometer	2639 independent reflections
Radiation source: fine-focus sealed tube	2338 reflections with $F^2 > 2.0\sigma(F^2)$
Monochromator: graphite	R_{int} = 0.072
Detector resolution: 6.85 pixels mm^{-1}	θ_{max} = 25.4º
T = 125 K	θ_{min} = 2.1º
ω scans	*h* = −8→8
Absorption correction: multi-scan (ABSCOR; Higashi, 1995)	*k* = −20→20
T_{min} = 0.662, T_{max} = 0.791	*l* = −16→16
6333 measured reflections	

Refinement

Refinement on F^2	H-atom parameters constrained
$R[F^2 > 2\sigma(F^2)]$ = 0.054	*w* = 1/[σ^2^(F_o^2^) + (0.0247*P*)^2^] where *P* = (F_o^2^ + 2F_c^2^)/3
$wR(F^2)$ = 0.090	$(\Delta/\sigma)_{max}$ < 0.001
S = 1.07	$\Delta\rho_{max}$ = 1.26 e Å^{-3}
2639 reflections	$\Delta\rho_{min}$ = −0.71 e Å^{-3}
161 parameters	Extinction correction: none
Primary atom site location: structure-invariant direct methods	Absolute structure: Flack,(1983), 1308 Friedel pairs
Hydrogen site location: inferred from neighbouring sites	Flack parameter: −0.01 (5)

Special details

Geometry. ENTER SPECIAL DETAILS OF THE MOLECULAR GEOMETRY

Refinement. Refinement was performed using all reflections. The weighted *R*-factor (*wR*) and goodness of fit (*S*) are based on F^2. *R*-factor (gt) are based on *F*. The threshold expression of $F^2 > 2.0\ \sigma(F^2)$ is used only for calculating *R*-factor (gt).

Fractional atomic coordinates and isotropic or equivalent isotropic displacement parameters (Å^2)

	x	*y*	*z*	U_{iso}*/U_{eq}
Pd(1)	0.50973 (10)	0.10743 (4)	0.45788 (7)	0.01777 (16)
Cl(1)	0.4602 (3)	0.23766 (14)	0.39555 (17)	0.0298 (6)
Cl(2)	0.2407 (3)	0.06430 (14)	0.33413 (17)	0.0277 (6)
P(1)	0.5605 (3)	−0.01677 (14)	0.51540 (16)	0.0183 (5)
P(2)	0.7614 (3)	0.15409 (14)	0.57243 (17)	0.0201 (5)
O(1)	0.7314 (8)	−0.0612 (3)	0.4734 (4)	0.0215 (14)
O(2)	0.3841 (8)	−0.0766 (3)	0.4858 (4)	0.0210 (14)
O(3)	0.6237 (9)	−0.0227 (3)	0.6348 (4)	0.0252 (15)
O(4)	0.9294 (8)	0.0917 (3)	0.6089 (4)	0.0259 (15)
O(5)	0.6928 (8)	0.1816 (3)	0.6740 (4)	0.0267 (15)
O(6)	0.8710 (8)	0.2305 (3)	0.5430 (4)	0.0202 (14)
C(1)	0.7285 (16)	−0.0650 (6)	0.3643 (6)	0.034 (2)
C(2)	0.1966 (14)	−0.0676 (5)	0.5230 (7)	0.030 (2)
C(3)	0.6711 (15)	−0.0993 (5)	0.6843 (7)	0.033 (2)
C(4)	1.1106 (14)	0.1149 (5)	0.6777 (7)	0.036 (2)
C(5)	0.5731 (15)	0.2526 (5)	0.6788 (6)	0.032 (2)
C(6)	0.9618 (13)	0.2290 (5)	0.4527 (8)	0.032 (2)
H(1)	0.7662	−0.1183	0.3459	0.041*
H(2)	0.8233	−0.0265	0.3455	0.041*
H(3)	0.5939	−0.0527	0.3281	0.041*
H(4)	0.2211	−0.0723	0.5972	0.037*
H(5)	0.1031	−0.1090	0.4935	0.037*
H(6)	0.1394	−0.0155	0.5034	0.037*
H(7)	0.6000	−0.1045	0.7417	0.040*
H(8)	0.8152	−0.1028	0.7089	0.040*
H(9)	0.6298	−0.1419	0.6354	0.040*
H(10)	1.2047	0.1387	0.6388	0.043*
H(11)	1.1716	0.0681	0.7138	0.043*
H(12)	1.0774	0.1534	0.7269	0.043*
H(13)	0.6614	0.2980	0.6975	0.038*
H(14)	0.4874	0.2454	0.7298	0.038*
H(15)	0.4901	0.2621	0.6123	0.038*
H(16)	1.0930	0.2546	0.4672	0.038*
H(17)	0.8764	0.2575	0.3977	0.038*
H(18)	0.9775	0.1740	0.4321	0.038*

Atomic displacement parameters (Å^2)

	U^{11}	U^{22}	U^{33}	U^{12}	U^{13}	U^{23}
Pd(1)	0.0217 (3)	0.0152 (3)	0.0159 (3)	0.0006 (3)	0.0018 (2)	−0.0001 (3)
Cl(1)	0.0375 (15)	0.0183 (13)	0.0301 (14)	0.0010 (12)	−0.0040 (11)	0.0048 (10)
Cl(2)	0.0321 (14)	0.0253 (14)	0.0223 (13)	−0.0027 (12)	−0.0050 (11)	0.0006 (10)

P(1)	0.0228 (14)	0.0171 (13)	0.0157 (13)	−0.0017 (11)	0.0056 (10)	−0.0012 (9)
P(2)	0.0234 (15)	0.0173 (14)	0.0193 (13)	−0.0010 (11)	0.0031 (11)	−0.0002 (10)
O(1)	0.031 (3)	0.019 (3)	0.014 (3)	0.013 (3)	0.003 (2)	0.002 (2)
O(2)	0.024 (3)	0.019 (3)	0.020 (3)	0.001 (2)	0.004 (2)	0.004 (2)
O(3)	0.038 (4)	0.019 (3)	0.016 (3)	0.005 (3)	−0.002 (2)	0.002 (2)
O(4)	0.021 (3)	0.017 (3)	0.037 (3)	0.000 (2)	−0.003 (3)	−0.001 (2)
O(5)	0.036 (4)	0.026 (3)	0.019 (3)	0.000 (3)	0.006 (2)	−0.002 (2)
O(6)	0.025 (3)	0.019 (3)	0.017 (3)	0.000 (2)	0.005 (2)	0.004 (2)
C(1)	0.050 (7)	0.038 (6)	0.014 (5)	0.015 (5)	0.006 (5)	−0.010 (4)
C(2)	0.030 (6)	0.026 (5)	0.036 (6)	−0.002 (5)	0.008 (4)	−0.002 (5)
C(3)	0.046 (6)	0.024 (5)	0.030 (5)	0.006 (5)	0.006 (4)	−0.002 (4)
C(4)	0.026 (5)	0.029 (6)	0.047 (6)	0.006 (4)	−0.007 (4)	0.007 (5)
C(5)	0.045 (6)	0.036 (6)	0.016 (5)	−0.003 (5)	0.011 (4)	−0.009 (4)
C(6)	0.037 (8)	0.028 (5)	0.033 (5)	−0.005 (4)	0.013 (5)	−0.008 (5)

Geometric parameters (Å, °)

Pd(1)—Cl(1)	2.356 (2)	C(1)—H(2)	0.980
Pd(1)—Cl(2)	2.358 (2)	C(1)—H(3)	0.980
Pd(1)—P(1)	2.241 (2)	C(2)—H(4)	0.980
Pd(1)—P(2)	2.233 (2)	C(2)—H(5)	0.980
P(1)—O(1)	1.568 (6)	C(2)—H(6)	0.980
P(1)—O(2)	1.567 (6)	C(3)—H(7)	0.980
P(1)—O(3)	1.583 (5)	C(3)—H(8)	0.980
P(2)—O(4)	1.568 (6)	C(3)—H(9)	0.980
P(2)—O(5)	1.582 (6)	C(4)—H(10)	0.980
P(2)—O(6)	1.575 (6)	C(4)—H(11)	0.980
O(1)—C(1)	1.457 (10)	C(4)—H(12)	0.980
O(2)—C(2)	1.457 (12)	C(5)—H(13)	0.980
O(3)—C(3)	1.464 (10)	C(5)—H(14)	0.980
O(4)—C(4)	1.458 (10)	C(5)—H(15)	0.980
O(5)—C(5)	1.458 (11)	C(6)—H(16)	0.980
O(6)—C(6)	1.451 (12)	C(6)—H(17)	0.980
C(1)—H(1)	0.980	C(6)—H(18)	0.980
Cl(1)···O(5)^{i}	3.473 (5)	H(4)···O(6)^{iii}	3.594
Cl(1)···C(5)^{i}	3.563 (8)	H(4)···C(4)^{viii}	3.466
O(1)···C(2)^{ii}	3.121 (11)	H(4)···C(5)^{iii}	3.367
O(2)···O(6)^{iii}	3.352 (7)	H(4)···H(8)^{viii}	3.402
O(2)···C(6)^{iii}	3.367 (10)	H(4)···H(11)^{viii}	2.891
O(3)···C(1)^{iv}	3.369 (10)	H(4)···H(13)^{iii}	2.636
O(4)···C(2)^{ii}	3.550 (11)	H(4)···H(15)^{iii}	3.232
O(5)···Cl(1)^{v}	3.473 (5)	H(5)···Cl(1)^{iii}	2.989
O(5)···C(1)^{iv}	3.194 (11)	H(5)···O(1)^{viii}	2.624
O(6)···O(2)^{vi}	3.352 (7)	H(5)···O(6)^{iii}	3.271
C(1)···O(3)^{vii}	3.369 (10)	H(5)···C(1)^{viii}	2.915
C(1)···O(5)^{vii}	3.194 (11)	H(5)···C(5)^{iii}	3.440

C(1)···C(2)^{ii}	3.506 (13)	H(5)···H(1)^{viii}	2.756
C(2)···O(1)^{viii}	3.121 (11)	H(5)···H(2)^{viii}	2.858
C(2)···O(4)^{viii}	3.550 (11)	H(5)···H(13)^{iii}	3.113
C(2)···C(1)^{viii}	3.506 (13)	H(5)···H(15)^{iii}	2.879
C(5)···Cl(1)^{v}	3.563 (8)	H(5)···H(17)^{iii}	3.321
C(6)···O(2)^{vi}	3.367 (10)	H(6)···O(1)^{viii}	2.842
Pd(1)···H(7)^{vii}	3.060	H(6)···O(4)^{viii}	2.832
Pd(1)···H(10)^{viii}	3.493	H(6)···C(1)^{viii}	3.188
Cl(1)···H(1)^{ix}	2.793	H(6)···C(4)^{viii}	3.238
Cl(1)···H(5)^{vi}	2.989	H(6)···H(1)^{viii}	3.469
Cl(1)···H(7)^{vii}	3.300	H(6)···H(2)^{viii}	2.745
Cl(1)···H(12)^{i}	3.121	H(6)···H(10)^{viii}	3.158
Cl(1)···H(13)^{i}	3.103	H(6)···H(11)^{viii}	3.121
Cl(1)···H(14)^{i}	3.585	H(6)···H(18)^{viii}	3.466
Cl(1)···H(16)^{viii}	2.843	H(7)···Pd(1)^{iv}	3.060
Cl(1)···H(18)^{viii}	3.571	H(7)···Cl(1)^{iv}	3.300
Cl(2)···H(2)^{viii}	3.255	H(7)···Cl(2)^{iv}	3.005
Cl(2)···H(4)^{vii}	3.151	H(7)···C(1)^{iv}	3.339
Cl(2)···H(7)^{vii}	3.005	H(7)···H(2)^{iv}	2.897
Cl(2)···H(8)^{x}	3.149	H(7)···H(3)^{iv}	2.900
Cl(2)···H(11)^{x}	2.747	H(7)···H(13)^{iii}	3.370
Cl(2)···H(13)^{i}	2.949	H(7)···H(18)^{iv}	3.489
Cl(2)···H(18)^{viii}	3.031	H(8)···Cl(2)^{xiv}	3.149
O(1)···H(4)^{ii}	3.457	H(8)···C(5)^{xi}	3.076
O(1)···H(5)^{ii}	2.624	H(8)···H(2)^{iv}	2.842
O(1)···H(6)^{ii}	2.842	H(8)···H(3)^{iv}	3.543
O(1)···H(16)^{iii}	3.250	H(8)···H(4)^{ii}	3.402
O(2)···H(16)^{iii}	3.216	H(8)···H(13)^{xi}	2.917
O(2)···H(17)^{iii}	3.038	H(8)···H(14)^{xi}	2.814
O(3)···H(2)^{iv}	3.022	H(8)···H(15)^{xi}	2.973
O(3)···H(3)^{iv}	2.920	H(8)···H(18)^{iv}	3.229
O(4)···H(1)^{iv}	3.567	H(9)···O(6)^{iii}	2.917
O(4)···H(2)^{iv}	3.543	H(9)···C(5)^{xi}	3.465
O(4)···H(4)^{ii}	3.429	H(9)···C(6)^{iii}	3.325
O(4)···H(6)^{ii}	2.832	H(9)···H(13)^{iii}	3.578
O(5)···H(1)^{iv}	2.506	H(9)···H(14)^{xi}	3.173
O(5)···H(2)^{iv}	3.494	H(9)···H(15)^{xi}	3.001
O(5)···H(3)^{iv}	3.151	H(9)···H(16)^{iii}	2.826
O(5)···H(10)^{viii}	3.352	H(10)···Pd(1)^{ii}	3.493
O(6)···H(4)^{vi}	3.594	H(10)···O(5)^{ii}	3.352
O(6)···H(5)^{vi}	3.271	H(10)···C(5)^{ii}	3.132

O(6)···H(9)^{vi}	2.917	H(10)···H(6)^{ii}	3.158
C(1)···H(5)^{ii}	2.915	H(10)···H(14)^{ii}	2.759
C(1)···H(6)^{ii}	3.188	H(10)···H(15)^{ii}	2.914
C(1)···H(7)^{vii}	3.339	H(11)···Cl(2)^{xiv}	2.747
C(1)···H(12)^{vii}	3.575	H(11)···C(2)^{ii}	3.457
C(1)···H(16)^{iii}	3.534	H(11)···H(2)^{iv}	3.268
C(2)···H(1)^{viii}	3.535	H(11)···H(3)^{xiv}	3.021
C(2)···H(2)^{viii}	3.235	H(11)···H(4)^{ii}	2.891
C(2)···H(11)^{viii}	3.457	H(11)···H(6)^{ii}	3.121
C(2)···H(13)^{iii}	3.293	H(12)···Cl(1)^{v}	3.121
C(2)···H(15)^{iii}	3.502	H(12)···C(1)^{iv}	3.575
C(3)···H(2)^{iv}	3.075	H(12)···H(1)^{iv}	2.925
C(3)···H(3)^{iv}	3.305	H(12)···H(2)^{iv}	3.327
C(3)···H(14)^{xi}	3.381	H(12)···H(14)^{ii}	3.188
C(3)···H(15)^{xi}	3.443	H(12)···H(17)^{v}	3.161
C(4)···H(1)^{iv}	3.522	H(13)···Cl(1)^{v}	3.103
C(4)···H(2)^{iv}	3.554	H(13)···Cl(2)^{v}	2.949
C(4)···H(4)^{ii}	3.466	H(13)···C(2)^{vi}	3.293
C(4)···H(6)^{ii}	3.238	H(13)···H(4)^{vi}	2.636
C(4)···H(14)^{ii}	3.361	H(13)···H(5)^{vi}	3.113
C(5)···H(1)^{iv}	3.293	H(13)···H(7)^{vi}	3.370
C(5)···H(4)^{vi}	3.367	H(13)···H(8)^{ix}	2.917
C(5)···H(5)^{vi}	3.440	H(13)···H(9)^{vi}	3.578
C(5)···H(8)^{ix}	3.076	H(14)···Cl(1)^{v}	3.585
C(5)···H(9)^{ix}	3.465	H(14)···C(3)^{ix}	3.381
C(5)···H(10)^{viii}	3.132	H(14)···C(4)^{viii}	3.361
C(5)···H(17)^{xii}	3.430	H(14)···C(6)^{xii}	3.047
C(6)···H(9)^{vi}	3.325	H(14)···H(1)^{iv}	3.097
C(6)···H(14)^{xiii}	3.047	H(14)···H(3)^{iv}	3.538
H(1)···Cl(1)^{xi}	2.793	H(14)···H(8)^{ix}	2.814
H(1)···O(4)^{vii}	3.567	H(14)···H(9)^{ix}	3.173
H(1)···O(5)^{vii}	2.506	H(14)···H(10)^{viii}	2.759
H(1)···C(2)^{ii}	3.535	H(14)···H(12)^{viii}	3.188
H(1)···C(4)^{vii}	3.522	H(14)···H(16)^{xii}	3.131
H(1)···C(5)^{vii}	3.293	H(14)···H(17)^{xii}	2.492
H(1)···H(5)^{ii}	2.756	H(14)···H(18)^{xii}	3.040
H(1)···H(6)^{ii}	3.469	H(15)···C(2)^{vi}	3.502
H(1)···H(12)^{vii}	2.925	H(15)···C(3)^{ix}	3.443
H(1)···H(14)^{vii}	3.097	H(15)···H(4)^{vi}	3.232
H(1)···H(16)^{iii}	3.050	H(15)···H(5)^{vi}	2.879
H(1)···H(17)^{iii}	3.545	H(15)···H(8)^{ix}	2.973

H(2)···Cl(2)^{ii}	3.255	H(15)···H(9)^{ix}	3.001
H(2)···O(3)^{vii}	3.022	H(15)···H(10)^{viii}	2.914
H(2)···O(4)^{vii}	3.543	H(15)···H(16)^{viii}	3.041
H(2)···O(5)^{vii}	3.494	H(16)···Cl(1)^{ii}	2.843
H(2)···C(2)^{ii}	3.235	H(16)···O(1)^{vi}	3.250
H(2)···C(3)^{vii}	3.075	H(16)···O(2)^{vi}	3.216
H(2)···C(4)^{vii}	3.554	H(16)···C(1)^{vi}	3.534
H(2)···H(5)^{ii}	2.858	H(16)···H(1)^{vi}	3.050
H(2)···H(6)^{ii}	2.745	H(16)···H(9)^{vi}	2.826
H(2)···H(7)^{vii}	2.897	H(16)···H(14)^{xiii}	3.131
H(2)···H(8)^{vii}	2.842	H(16)···H(15)^{ii}	3.041
H(2)···H(11)^{vii}	3.268	H(17)···O(2)^{vi}	3.038
H(2)···H(12)^{vii}	3.327	H(17)···C(5)^{xiii}	3.430
H(3)···O(3)^{vii}	2.920	H(17)···H(1)^{vi}	3.545
H(3)···O(5)^{vii}	3.151	H(17)···H(5)^{vi}	3.321
H(3)···C(3)^{vii}	3.305	H(17)···H(12)^{i}	3.161
H(3)···H(7)^{vii}	2.900	H(17)···H(14)^{xiii}	2.492
H(3)···H(8)^{vii}	3.543	H(18)···Cl(1)^{ii}	3.571
H(3)···H(11)^{x}	3.021	H(18)···Cl(2)^{ii}	3.031
H(3)···H(14)^{vii}	3.538	H(18)···H(6)^{ii}	3.466
H(4)···Cl(2)^{iv}	3.151	H(18)···H(7)^{vii}	3.489
H(4)···O(1)^{viii}	3.457	H(18)···H(8)^{vii}	3.229
H(4)···O(4)^{viii}	3.429	H(18)···H(14)^{xiii}	3.040
Cl(1)—Pd(1)—Cl(2)	89.71 (8)	O(2)—C(2)—H(4)	109.5
Cl(1)—Pd(1)—P(1)	179.04 (9)	O(2)—C(2)—H(5)	109.5
Cl(1)—Pd(1)—P(2)	87.59 (8)	O(2)—C(2)—H(6)	109.5
Cl(2)—Pd(1)—P(1)	90.32 (8)	H(4)—C(2)—H(5)	109.5
Cl(2)—Pd(1)—P(2)	177.30 (8)	H(4)—C(2)—H(6)	109.5
P(1)—Pd(1)—P(2)	92.38 (8)	H(5)—C(2)—H(6)	109.5
Pd(1)—P(1)—O(1)	113.9 (2)	O(3)—C(3)—H(7)	109.5
Pd(1)—P(1)—O(2)	116.9 (2)	O(3)—C(3)—H(8)	109.5
Pd(1)—P(1)—O(3)	113.8 (2)	O(3)—C(3)—H(9)	109.5
O(1)—P(1)—O(2)	100.6 (3)	H(7)—C(3)—H(8)	109.5
O(1)—P(1)—O(3)	104.1 (3)	H(7)—C(3)—H(9)	109.5
O(2)—P(1)—O(3)	106.0 (3)	H(8)—C(3)—H(9)	109.5
Pd(1)—P(2)—O(4)	113.9 (2)	O(4)—C(4)—H(10)	109.5
Pd(1)—P(2)—O(5)	112.8 (2)	O(4)—C(4)—H(11)	109.5
Pd(1)—P(2)—O(6)	117.3 (2)	O(4)—C(4)—H(12)	109.5
O(4)—P(2)—O(5)	103.9 (3)	H(10)—C(4)—H(11)	109.5
O(4)—P(2)—O(6)	106.1 (3)	H(10)—C(4)—H(12)	109.5
O(5)—P(2)—O(6)	101.4 (3)	H(11)—C(4)—H(12)	109.5
P(1)—O(1)—C(1)	119.9 (5)	O(5)—C(5)—H(13)	109.5
P(1)—O(2)—C(2)	121.6 (5)	O(5)—C(5)—H(14)	109.5
P(1)—O(3)—C(3)	120.7 (5)	O(5)—C(5)—H(15)	109.5

P(2)—O(4)—C(4)	120.4 (5)	H(13)—C(5)—H(14)	109.5
P(2)—O(5)—C(5)	122.1 (5)	H(13)—C(5)—H(15)	109.5
P(2)—O(6)—C(6)	118.9 (5)	H(14)—C(5)—H(15)	109.5
O(1)—C(1)—H(1)	109.5	O(6)—C(6)—H(16)	109.5
O(1)—C(1)—H(2)	109.5	O(6)—C(6)—H(17)	109.5
O(1)—C(1)—H(3)	109.5	O(6)—C(6)—H(18)	109.5
H(1)—C(1)—H(2)	109.5	H(16)—C(6)—H(17)	109.5
H(1)—C(1)—H(3)	109.5	H(16)—C(6)—H(18)	109.5
H(2)—C(1)—H(3)	109.5	H(17)—C(6)—H(18)	109.5
Cl(1)—Pd(1)—P(2)—O(4)	−151.9 (2)	O(1)—P(1)—O(2)—C(2)	170.3 (5)
Cl(1)—Pd(1)—P(2)—O(5)	90.0 (2)	O(2)—P(1)—O(1)—C(1)	73.0 (6)
Cl(1)—Pd(1)—P(2)—O(6)	−27.2 (2)	O(1)—P(1)—O(3)—C(3)	−52.8 (7)
Cl(2)—Pd(1)—P(1)—O(1)	98.3 (2)	O(3)—P(1)—O(1)—C(1)	−177.4 (6)
Cl(2)—Pd(1)—P(1)—O(2)	−18.5 (2)	O(2)—P(1)—O(3)—C(3)	52.8 (7)
Cl(2)—Pd(1)—P(1)—O(3)	−142.6 (2)	O(3)—P(1)—O(2)—C(2)	62.1 (6)
P(1)—Pd(1)—P(2)—O(4)	27.1 (2)	Pd(1)—P(2)—O(4)—C(4)	175.4 (5)
P(1)—Pd(1)—P(2)—O(5)	−91.0 (2)	Pd(1)—P(2)—O(5)—C(5)	−71.2 (6)
P(1)—Pd(1)—P(2)—O(6)	151.9 (2)	Pd(1)—P(2)—O(6)—C(6)	−58.1 (5)
P(2)—Pd(1)—P(1)—O(1)	−81.8 (2)	O(4)—P(2)—O(5)—C(5)	165.0 (6)
P(2)—Pd(1)—P(1)—O(2)	161.4 (2)	O(5)—P(2)—O(4)—C(4)	−61.6 (7)
P(2)—Pd(1)—P(1)—O(3)	37.3 (2)	O(4)—P(2)—O(6)—C(6)	70.5 (5)
Pd(1)—P(1)—O(1)—C(1)	−52.9 (6)	O(6)—P(2)—O(4)—C(4)	44.8 (7)
Pd(1)—P(1)—O(2)—C(2)	−65.9 (6)	O(5)—P(2)—O(6)—C(6)	178.7 (5)
Pd(1)—P(1)—O(3)—C(3)	−177.3 (5)	O(6)—P(2)—O(5)—C(5)	55.1 (6)

Symmetry codes: (i) *x*−1/2, −*y*+1/2, *z*−1/2; (ii) *x*+1, *y*, *z*; (iii) *x*−1/2, *y*−1/2, *z*; (iv) *x*, −*y*, *z*+1/2; (v) *x*+1/2, −*y*+1/2, *z*+1/2; (vi) *x*+1/2, *y*+1/2, *z*; (vii) *x*, −*y*, *z*−1/2; (viii) *x*−1, *y*, *z*; (ix) *x*−1/2, *y*+1/2, *z*; (x) *x*−1, −*y*, *z*−1/2; (xi) *x*+1/2, *y*−1/2, *z*; (xii) *x*−1/2, −*y*+1/2, *z*+1/2; (xiii) *x*+1/2, −*y*+1/2, *z*−1/2; (xiv) *x*+1, −*y*, *z*+1/2.

Fig. 1